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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
TAKAO HARADA, ET AL. : EXAMINER: ZHU, WEIPING
SERIAL NO: 10/552,465 :
FILED: OCTOBER 7, 2005 : GROUP ART UNIT: 1793
FOR: METHOD FOR PRODUCING :
IMPROVED COAL FOR USE IN
METALLURGY, AND METHOD FOR
PRODUCING REDUCED METAL AND
SLAG CONTAINING OXIDIZED
NONFERROUS METAL

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal from the Final Rejection dated September 9, 2009. A Notice of Appeal was timely filed on February 1, 2010.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Kabushiki Kaisha Kobe Seiko Sho (Kobe Steel, Ltd.) having an address of 10-26, Wakinohama-cho 2-chome, Chuo-ku, Kobe-shi, Hyogo, Japan, 651-8585.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-13 stand twice rejected and the rejections are herein appealed. Claims 14-21 are withdrawn.

IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed. A Request for Reconsideration was filed December 15, 2009.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

It is preliminarily noted that references in brackets are to page and line number of the specification as filed.

Independent Claim 1 provides a method for producing upgraded coal for metallurgy [page 5, lines 16-22], comprising:

mixing a low rank coal [page 13, lines 11-14], and an organic solvent [page 16, line 20 to page 17, line 17], in a slurry preparation tank to prepare a raw material slurry;

aging the raw material slurry in an aging tank [page 14, lines 2-4], by heating [page 13, lines 19-23], to extract a soluble component of the low rank coal in the organic solvent to prepare an extracted slurry [page 15, lines 4-14]; and

removing the organic solvent from the extracted slurry by evaporation [page 15, lines 4-9] to produce upgraded coal for metallurgy as a solid form [page 15, last 4 lines];

wherein hydrogen is not added to the slurry preparation tank or the aging tank and the organic solvent is not rehydrogenated [page 17, lines 6-10].

Claims 2 and 6-13 directly depend from Claim 1 and stand or fall with the independent claim.

Dependent Claim 3 depends from Claim 1 and further provides the description that the solvent removal comprises:

sedimenting an insoluble component of the coal by allowing the extracted slurry to stand to separate between a supernatant containing an extracted coal, which is the extracted soluble component, and a residual coal slurry containing a residual coal, which is the sedimented insoluble component {page 18, line 15 to page 19, line 4};

removing the organic solvent from the supernatant by evaporation to produce the extracted coal as a solid form; and

removing the organic solvent from the residual coal slurry by evaporation to produce the residual coal as a solid form [page 19, lines 5-14].

Claims 4 and 5 depend from Claim 3 and describe compounding the extracted coal and the residual coal to produce the upgraded coal for metallurgy having a controlled thermal plasticity [page 19, lines 15-19] wherein a compounding ratio of the residual coal to the upgraded coal for metallurgy is over 0% by mass and 70% by mass or less [page 19, lines 20-22].

Claims 3-5 stand or fall together.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-13 stand twice rejected under 35 U.S.C. § 103(a), as being unpatentable over Brink et al. (U.S. 4,045,187) in view of Miller et al. (U.S. 4,617,105).

VII. ARGUMENT

Rejection of Claims 1, 2 and 6-13 under 35 U.S.C. § 103(a), over Brink et al. (U.S. 4,045,187) in view of Miller et al. (U.S. 4,617,105).

The claimed invention provides a method to produce an upgraded coal which does not employ hydrogen either in the extraction process or to replenish a hydrogen donor extraction solvent. Appellants have described the disadvantage of the use of hydrogen in a coal upgrade process (page 5, lines 6-11) and have further described that when a solvent according to the present invention is employed as described in the invention, hydrogenation, i.e., the use of hydrogen is not needed (page 17, lines 6-10).

Brink describes a process for the manufacture of coke by deoxygenation and removal of water comprising heating the carbonaceous material in intimate contact with a liquid solvent, a hydrogen carrier and hydrogen under pressure (Claim 11 in pertinent part). Brink describes reduction of high oxygen content coal by reaction with hydrogen either directly (hydrogen pressure) or via a hydrogen carrier (Col. 2, lines 18-38). Appellants submit that Brink requires hydrogen to reduce the oxygen to water, i.e., deoxygenation.

The Office has cited Miller as showing nitrogen to be functionally equivalent to hydrogen (Official Action dated September 9, 2009, page 3, lines 13-20):

. . . , the Examiner notes that Miller ('105) discloses that the atmosphere during the extraction step can be air or an inert gas, e.g., nitrogen or helium at atmospheric or elevated pressures . . . ; and a process for thermal solvent refining or hydroliquefaction of non-anthracitic coal at

elevated temperatures under hydrogen pressure in a hydrogen donor solvent . . . , clearly suggesting that a hydrogen pressure and a nitrogen pressure . . . in a coal extraction process are functionally equivalent.

The Office reiterates this equivalency in the Advisory Action of January 14, 2010 (continuation page, second paragraph). Appellants totally disagree and point out that the description of Miller cited by the Office states:

The atmosphere during the extraction step can be air or an inert gas, e.g., nitrogen or helium. The extraction can be done either in a batch process or continuously.

The extracted coal may be transferred from the extractor to the liquefaction reactor under pressure, . . . **If the extraction was done under an inert atmosphere, hydrogen can be added to the feed before transfer to the hydroliquefaction reactor or can be added directly to the liquefaction reactor.** (Bold and underlining added for emphasis)

Miller also clearly describes the necessity for hydrogen to replenish the hydrogen donor solvent (Col. 1, line 61 to Col. 2, line 2):

Hydrogen donor solvents must dissolve the products from coal liquefaction and must be capable of reversible hydrogenation and dehydrogenation. The donor solvent therefore functions as a hydrogen carrier, upon which hydrogen is loaded and introduced into the reaction mixture. Hydrogenated donor solvent then transfers hydrogen to free radicals generated during coal liquefaction and the hydrogen-depleted solvent is separated from the products and is rehydrogenated before recycling to the coal liquefaction reaction.

As Appellants have described above both cited references require hydrogen as a chemically active reducing agent. This chemical reaction is well known to one of ordinary skill in the art and equally well known is that an inert gas such as nitrogen cannot function in this same manner and cannot be functionally equivalent to hydrogen. Nitrogen by the very definition of being an inert gas cannot reduce oxygen or react with free radicals produced in the coal liquefaction process. The functional equivalency of nitrogen to hydrogen alleged by the Office misinterprets the description of the references and reflects an error in the understanding of the chemical reactions required in the processes of the references.

As described above, Brink requires hydrogen to reduce the oxygen. Appellants submit that it is well known that nitrogen will not reduce oxygen and therefore, substitution of nitrogen for hydrogen as the Office suggests, would render the Brink process inoperable because nitrogen would not replenish the hydrogen donor solvent.

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F. 2d 900, 221 USPQ 1125 (Fed. Cir. 1984)

For all the above reasons, the rejection of Claims 1, 2 and 6-13 under 35 U.S.C. § 103(a), over Brink et al. (U.S. 4,045,187) in view of Miller et al. (U.S. 4,617,105) should be reversed.

Rejection of Claims 3-5 under 35 U.S.C. § 103(a), over Brink et al. (U.S. 4,045,187) in view of Miller et al. (U.S. 4,617,105).

Appellants note that Claims 3-5 depend from Claim 1 and therefore all the above remarks are applicable in this discussion as well.

Claims 3-5 of the present invention describe separation of an extracted coal and a residual coal (Claim 3), the recombining (compounding) the extracted coal and the residual coal in a manner to produce an upgraded coal having controlled thermal plasticity (Claim 4). Claim 5 describes the relative proportions of the two components.


Neither reference discloses or suggests separation of the two components and recombination is a proportion to control the thermal plasticity of the upgraded coal. Therefore, the rejection of Claims 3-5 under 35 U.S.C. § 103(a), over Brink et al. (U.S. 4,045,187) in view of Miller et al. (U.S. 4,617,105) should be reversed.

CONCLUSION

For the above reasons, it is respectfully requested that all outstanding rejections of the pending claims be reversed.

Respectfully submitted,

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VIII. CLAIMS APPENDIX.

Claim 1 (Rejected): A method for producing upgraded coal for metallurgy comprising:

mixing a low rank coal and an organic solvent in a slurry preparation tank to prepare a raw material slurry;

aging the raw material slurry in an aging tank by heating to extract a soluble component of the low rank coal in the organic solvent to prepare an extracted slurry; and

removing the organic solvent from the extracted slurry by evaporation to produce upgraded coal for metallurgy as a solid form;

wherein hydrogen is not added to the slurry preparation tank or the aging tank and the organic solvent is not rehydrogenated.

Claim 2 (Rejected): The method according to claim 1, wherein the solvent removal comprises:

sedimenting an insoluble component of the coal by allowing the extracted slurry to stand to separate between a supernatant containing an extracted coal, which is the extracted soluble component, and a residual coal slurry containing a residual coal, which is the sedimented insoluble component; and

removing the organic solvent from the supernatant by evaporation to produce the extracted coal as the upgraded coal for metallurgy.

Claim 3 (Rejected): The method according to claim 1, wherein the solvent removal comprises:

sedimenting an insoluble component of the coal by allowing the extracted slurry to stand to separate between a supernatant containing an extracted coal, which is the extracted soluble component, and a residual coal slurry containing a residual coal, which is the sedimented insoluble component;

removing the organic solvent from the supernatant by evaporation to produce the extracted coal as a solid form; and

removing the organic solvent from the residual coal slurry by evaporation to produce the residual coal as a solid form.

Claim 4 (Rejected): The method according to claim 3 further comprising:

compounding the extracted coal and the residual coal to produce the upgraded coal for metallurgy having a controlled thermal plasticity.

Claim 5 (Rejected): The method according to claim 4, wherein a compounding ratio of the residual coal to the upgraded coal for metallurgy is over 0% by mass and 70% by mass or less.

Claim 6 (Rejected): The method according to claim 1, wherein a heating temperature for aging the raw material slurry is 250°C to 400°C.

Claim 7 (Rejected): The method according to claim 1, wherein a time for aging the raw material slurry is 5 to 120 minutes.

Claim 8 (Rejected): The method according to claim 1, wherein aging the raw material slurry is performed in a nitrogen atmosphere at 0.5 MPa or more.

Claim 9 (Rejected): The method according to claim 1, wherein
the organic solvent comprises a two ring aromatic compound as a main component,
and
has a boiling point of 200°C to 300°C at normal pressure.

Claim 10 (Rejected): This method according to claim 1 further comprising recovering
the organic solvent removed by evaporation and recycling the solvent to the slurry
preparation.

Claim 11 (Rejected): The method according to claim 10, wherein
the recovered organic solvent is not rehydrogenated.

Claim 12 (Rejected): The method according to claim 10, wherein recovering the
organic solvent comprises vacuum distillation or spray drying.

Claim 13 (Rejected): An upgraded coal for metallurgy produced by the method
according to claim 1.

Claim 14 (Withdrawn): A method for producing a reduced metal using upgraded coal
for metallurgy produced by extracting coal with an organic solvent, the method comprising:
a coal upgrading step of aging the coal by heating in the organic solvent to produce
the upgraded coal for metallurgy having higher thermal plasticity than that of the coal;
a mixing step of mixing the upgraded coal for metallurgy and a metal oxide raw
material containing a metal oxide to prepare a mixture; and

a reduction step of reducing the mixture by heating in a moving hearth furnace to produce a reduced metal as a reduced mixture.

Claim 15 (Withdrawn): The method according to claim 14 further comprising:
a step of successively heating the reduced mixture in the moving hearth furnace to coagulate the reduced metal in the reduced mixture.

Claim 16 (Withdrawn): The method according to claim 14 further comprising:
a melting step of melting the reduced mixture by heating in a melting furnace to separate between a metal and a slag; and
a recovering step of discharging the metal to the outside of the furnace and recovering the metal as the reduced metal.

Claim 17 (Withdrawn): The method according to claim 14 further comprising:
a reduction and melting step of reducing the mixture by heating in the moving hearth furnace to produce a reduced mixture, and then melting the reduced mixture by further heating to produce the reduced metal.

Claim 18 (Withdrawn): The method according to claim 14 further comprising:
a reduction and melting step of reducing the mixture by heating in the moving hearth furnace to produce a reduced mixture, and then melting the reduced mixture by further heating to produce the reduced metal;
a solidification step of solidifying the reduced metal by cooling in the moving hearth furnace to produce a reduced solid; and

a separation and recovery step of discharging the reduced solid to the outside of the furnace to separate between a metal and a slag and recover the metal as the reduced metal.

Claim 19 (Withdrawn): A method for producing a slag containing an oxidized nonferrous metal using upgraded coal for metallurgy, which is produced by extracting coal with an organic solvent, the method comprising:

a coal upgrading step of aging the coal by heating in the organic solvent to produce upgraded coal for metallurgy which has higher thermal plasticity than that of the coal;

a mixing step of mixing the upgraded coal for metallurgy and a metal oxide-containing raw material containing iron oxide and an oxidized nonferrous metal to prepare a mixture;

a reduction and melting step of reducing the iron oxide in the mixture by heating the mixture in a moving hearth furnace to produce a reduced mixture containing metallic iron, and then melting the metallic iron by heating the reduced mixture to separate between the metallic iron and an oxidized nonferrous metal slag;

a solidification step of solidifying the metallic iron in the mixture containing the oxidized nonferrous metal slag and the melted metallic iron by cooling in the moving hearth furnace to produce a reduced solid; and

a separation and recovery step of discharging the reduced solid to the outside of the furnace to separate between the metal and the slag and recover the slag as the oxidized nonferrous metal slag.

Claim 20 (Withdrawn): A reduced metal produced by the method according to claim 14.

Claim 21 (Withdrawn): A slag containing an oxidized nonferrous metal produced by the method according to claim 19.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None